



FILE COPY

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION I

1 CONGRESS STREET, SUITE 1100
BOSTON, MASSACHUSETTS 02114-2023

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

AUG 27 2007

Michael Ryan, Director of Buildings and Maintenance
City of Quincy
Department of Public Works
107 Woodward Avenue
Quincy, Massachusetts 02169-4421

Re: Decontamination Approval under 40 CFR §§761.61, 761.62, and 761.79(h)

Dear Mr. Ryan:

This is in response to the City of Quincy Department of Public Works (Quincy DPW) Application¹ for approval of a proposed PCB cleanup at 52 Coddington Street, Quincy, Massachusetts (the Site). The Site contains PCB-contaminated materials that exceed the allowable PCB levels under the federal PCB regulations at 40 CFR §761.61 and §761.62. Specifically, PCB-contaminated caulking has been identified at Building 1921 and Quincy DPW has requested an approval to decontaminate *porous surfaces* contaminated with PCB caulking (e.g. *PCB bulk product waste*) under 40 CFR §761.61(a).

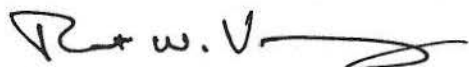
Quincy has proposed a PCB cleanup standard of less than or equal to (\leq) 1 part per million for *porous surfaces*. Following decontamination of the PCB-impacted building materials, the building will be demolished and the materials will be recycled.

Based on the EPA's review, the information provided in the Application meets the requirements under 40 CFR §761.61, §761.62, and §761.79(h). Further, the proposed decontamination and disposal activities are consistent with the requirements and standards established under §761.61(a), §761.62, §761.79(a) for similar types of PCB-contaminated materials. Quincy DPW may proceed with its cleanup in accordance with 40 CFR §761.61(a); §761.62; §761.79(h); its Application; and this Approval, subject to the conditions of Attachment 1.

¹ The decontamination plan was prepared by Asbestos Environmental Consultants on your behalf to satisfy the requirements under 40 CFR §§761.61, 761.62 and 761.79(h). Information was provided dated July 27, 2007; August 15, 2007 (via fax); August 16, 2007 (via fax); August 17, 2007 (via fax); and, August 20, 2007. These submittals were superseded by information submitted by Expo Abatement Corporation dated August 22, 2007, which shall be referred to as the "Application."

EPA shall not consider this remediation complete until it has received all submittals required under this Approval. Should you have any questions on this matter, please contact Kimberly Tisa at (617) 918-1527.

Sincerely,

A handwritten signature in black ink, appearing to read "R. W. Varney", followed by a long horizontal flourish.

Robert W. Varney
Regional Administrator

cc: J. Snoonian, Expo Abatement

Attachment 1

Attachment 2

ATTACHMENT 1: PCB DECONTAMINATION APPROVAL CONDITIONS
QUINCY HIGH SCHOOL BUILDING 1921
52 CODDINGTON STREET
QUINCY, MASSACHUSETTS

GENERAL CONDITIONS

1. This Approval is granted under the authority of Section 6(e) of the Toxic Substances Control Act (TSCA), 15 U.S.C. §2605(e), and the PCB regulations at 40 CFR Part 761, and applies solely to the *PCB bulk product waste* and the *PCB remediation waste* located at the Site and identified in the Application, specifically the PCB-contaminated caulking and PCB-contaminated brick on Building 1921.
2. The City of Quincy Department of Public Works (Quincy DPW) shall conduct on-site activities in accordance with the conditions of this Approval and with the Application.
3. This Approval shall be revoked if the EPA does not receive written notification from Quincy DPW of its acceptance of the conditions of this Approval within 10 business days of receipt.
4. In the event that the cleanup plan described in the Application differs from the conditions specified in this Approval, the conditions of this Approval shall govern.
5. The terms and abbreviations used herein shall have the meanings as defined in 40 CFR §761.3 unless otherwise defined within this Approval.
6. Quincy DPW must comply with all applicable federal, state and local regulations in the storage, handling, and disposal of all PCB wastes, including PCBs, PCB Items and decontamination wastes generated under this Approval. In the event of a new spill during response actions, Quincy DPW shall contact EPA within 24 hours for direction on PCB cleanup and sampling requirements.
7. Quincy DPW is responsible for the actions of all officers, employees, agents, contractors, subcontractors, and others who are involved in activities conducted under this Approval. If at any time Quincy DPW has or receives information indicating that Quincy DPW or any other person has failed, or may have failed, to comply with any provision of this Approval, it must report the information to EPA in writing within 24 hours of having or receiving the information.
8. This Approval does not constitute a determination by EPA that the transporters or disposal facilities selected by Quincy DPW are authorized to conduct the activities set forth in the Application. Quincy DPW is responsible for ensuring that its selected transporters and disposal facilities are authorized to conduct these activities in accordance with all applicable federal, state and local statutes and regulations.

9. Quincy DPW shall notify EPA in writing of the scheduled date of commencement of on-site activities at least 1 business day prior to conducting any work under this Approval.
10. This Approval does not waive or compromise EPA's enforcement and regulatory authority, nor release Quincy DPW from any applicable requirements of federal, state or local law.

REMEDIAL AND DISPOSAL CONDITIONS

11. Prior to initiating onsite work under this Approval, Quincy DPW shall submit the following information for EPA review and/or approval:
 - a. A certification signed by its selected demolition and/or remediation contractor, stating that the contractor(s) has read and understands the Application, and agrees to abide by the conditions specified in this Approval; and,
 - b. A certification signed by the selected analytical laboratory, stating that the laboratory has read and understands the analytical and quality assurance requirements specified in the Application and in this Approval.
12. PCB-contaminated materials shall be decontaminated and confirmatory sampling and analysis shall be conducted as described below:
 - a. *PCB bulk product waste* (e.g. caulking) and a minimum of 4-inches of brick surrounding the caulking shall be removed as described in the Application.
 - b. The decontamination standard for *porous surfaces* (i.e. brick) shall be less than or equal to (\leq) 1 part per million (ppm) PCBs.
 - i) All post-decontamination verification sampling of *porous surfaces* shall be performed on a bulk basis (e.g. mg/Kg). Post-abatement confirmatory samples shall be collected in accordance with EPA's draft Standard Operating Procedure For Sampling Concrete in the Field, dated 12/30/97 to a maximum depth of 0.5 inches. A copy of this procedure is provided as Attachment 2 to this Approval.
 - ii) At least 1 confirmatory sample must be collected from each work area, and, the minimum confirmatory sampling frequency shall be 1 sample per every 10 linear feet of decontaminated *porous surfaces*.

- iii) Chemical extraction for PCBs shall be conducted using Methods 3500B/3540C of SW-846 for solid matrices and Method 3500B/3510C of SW-846 for aqueous matrices; and, chemical analysis for PCBs shall be conducted using Method 8082 of SW-846, unless another method(s) is validated according to Subpart Q.
 - c. For decontaminated *porous surfaces* that have PCB concentrations exceeding the decontamination standard, Quincy DPW may conduct additional decontamination to achieve the required decontamination standard.
13. To the maximum extent practical, engineering controls, such as critical barriers and negative pressure inside containment, and removal techniques, such as the use of HEPA ventilated tools, shall be utilized during removal processes to minimize the potential for release of PCB-contaminated dust outside of the containment area. In addition, to the maximum extent possible, disposable equipment and materials, including PPE, will be used to reduce the amount of decontamination necessary.
14. All PCB waste (regardless of concentration) generated as a result of the activities described in the Application, excluding any decontaminated materials, shall be marked in accordance with §761.40; stored in a manner prescribed in §761.65; and, disposed of in accordance with 40 CFR §761.61(a)(5), unless otherwise specified below:
- a. Non-liquid cleaning materials, PPE and similar materials resulting from decontamination may be disposed of in accordance with 40 CFR §761.79(g)(6).
 - b. Moveable equipment, tools, and sampling equipment shall be decontaminated in accordance with either 40 CFR §761.79(b)(3)(i)(A), §761.79(b)(3)(ii)(A), or §761.79(c)(2).
 - c. PCB-contaminated water generated during decontamination or dewatering shall be decontaminated in accordance with 40 CFR §761.79(b)(1) or disposed of under §761.70.

INSPECTION, MODIFICATION AND REVOCATION CONDITIONS

15. Quincy DPW shall allow any authorized representative of the Administrator of the EPA to inspect the Site and to inspect records and take samples as may be necessary to determine compliance with the PCB regulations and this Approval. Any refusal by Quincy DPW to allow such an inspection (as authorized by Section 11 of TSCA) shall be grounds for revocation of this Approval.

16. Any proposed modification(s) in the plan or specifications contained in the Application or any departure from the conditions of this Approval without prior, written authorization from the EPA may result in the revocation, suspension and/or modification of the Approval, in addition to any other legal or equitable relief or remedy the EPA may choose to pursue.
17. Any misrepresentation or omission of any material fact in the Application or in any records or reports may result in the EPA's revocation, suspension and/or modification of the Approval, in addition to any other legal or equitable relief or remedy the EPA may choose to pursue.

RECORDKEEPING AND REPORTING CONDITIONS

18. Quincy DPW shall prepare and maintain all records and documents required by 40 CFR Part 761, including but not limited to the records required under Subparts J and K. A written record of the decontamination and the analytical sampling shall be established and maintained by Quincy DPW in one centralized location. All records shall be made available for inspection by authorized representatives of the EPA, until such time as EPA approves in writing a request for an alternative disposition of such records.
19. Quincy DPW shall submit a final report to the EPA within 60 days of completion of the activities authorized under this Approval. At a minimum, this final report shall include: a short narrative of the project activities; characterization and confirmation sampling analytical results, if applicable; copies of the accompanying analytical chains of custody; field and laboratory quality control/quality assurance checks; an estimate of the quantity of PCB waste disposed of and the size of the remediated area(s); copies of manifests and bills of lading; and copies of certificates of disposal or similar certifications issued by the disposer.
20. Required submittals shall be mailed to:

Kimberly N. Tisa, PCB Coordinator
United States Environmental Protection Agency
1 Congress Street, Suite 1100 – CPT
Boston, Massachusetts 02114-2023
Telephone: (617) 918-1527
Facsimile: (617) 918-0527
21. No record, report or communication required under this Approval shall qualify as a self-audit or voluntary disclosure under EPA audit, self disclosure or penalty policies.

END OF ATTACHMENT 1

SOP: Concrete Sampling
Rev. #: 0.0
Date: 12/01/97
Page: 1 of 12

REGION I, EPA-NEW ENGLAND

DRAFT

**STANDARD OPERATING PROCEDURE
FOR SAMPLING CONCRETE IN THE FIELD**



U.S. EPA-NEW ENGLAND
Region I
Quality Assurance Unit Staff
Office of Environmental Measurement and Evaluation

Prepared by: **Alan W Peterson**
Quality Assurance Chemist

Date: 12/30/97

Reviewed by: **Andrew Beliveau**
Senior Technical Specialist

Date: 12/30/97

Approved by: **Nancy Barmakian**
Branch Chief

Date: 12/30/97

Region I, EPA New England

Standard Operating Procedure for Sampling Concrete in the Field

Table of Contents

1.0.....	Scope and Application	3
2.0.....	Method Summary	3
3.0.....	Health and Safety	4
4.0.....	Interferences and Potential Problems	4
5.0.....	Equipment and Supplies	4
5.1.....	Single Depth Concrete Sampling	4
5.2.....	Multiple Depth Sampling	4
6.0.....	Sample Containers, Preservation, and Storage	5
7.0.....	Procedure	5
7.1.....	Single Depth Concrete Sampling	5
7.2.....	Multiple Depth Concrete Sampling	6
7.3.....	Decontamination Procedure	7
8.0.....	Field Documentation	7
8.1.....	Field Logbooks	8
8.2.....	Sample Labeling and Chain-of-Custody	8
9.0.....	Quality Assurance and Quality Control (QA/QC)	9
9.1.....	Equipment Blanks	9
9.2.....	Field Duplicates	9
9.3.....	Laboratory Duplicates	10
9.4.....	Matrix Spike/Matrix Spike Duplicate Samples	10
9.5.....	Performance Evaluation Samples	11
9.6.....	Data Verification and Validation	11
9.7.....	Audits	12
10.0.....	References	12

Region I, EPA New England

Standard Operating Procedure for Sampling Concrete in the Field

1.0 Scope and Application

The following Standard Operating Procedure (SOP) describes a concrete sampling technique which uses an impact hammer drill to generate a uniform, finely ground, powder which is easily homogenized, extracted and analyzed. This procedure is primarily geared at providing enough sample for one or two different analyses at a time. That is, the time required to generate sufficient sample for a full suite of analyses may be impractical. The concrete powder is suitable for all types of environmental analyses, with the exception of volatile compounds, and may be analyzed in the field or at a fixed laboratory. This procedure is applicable for the collection of samples from concrete floors, walls, and ceilings.

The impact hammer drill is far less labor intensive than previous techniques using coring devices, or hammers and chisels. It allows for easy selection of sample location and sample depth. Not only can the project planner control the depth to sample into the concrete, from surface samples (0 - ½ inch) down to a core of the entire slab, but the technique can also be modified to collect samples at discrete depths within the concrete slab.

Another issue with concrete sampling is the fact that the amount of time spent drilling translates into the weight of sample produced. Thus, to maximize sampling time, it is important to know the minimum amount of sample required for each analysis. To do this, the project planner should take the following steps: 1) Use the Data Quality Objective (DQO) process and familiarity with the site to develop the objectives of the sampling project and the depth(s) of sample to be collected. 2) Review the site history and any previous data collected to determine possible contaminants of concern. 3) Establish the action levels for those possible contaminants and determine the appropriate analytical methods (both field and/or fixed laboratory) to meet the DQOs of the project. 4) Based on the detection limits of these methods, determine the amount of sample required for each analysis and the total sample weight required for each sample location (including quality control samples).

As with any environmental data collection project, all aspects of a concrete sampling episode should be well thought out, prior to going out in the field, and thoroughly described in a Quality Assurance Project Plan (QAPP). The QAPP should clearly state the DQOs of the project and document a complete Quality Assurance/Quality Control program to reconcile the data generated with the established DQOs. For more information on these subjects, refer to EPA documents QA/R-5, EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations, and QA/G-4, Guidance for the Data Quality Objective Process.

2.0 Method Summary

A one-inch diameter carbide drill bit is used in a rotary impact hammer drill to generate a fine concrete powder suitable for analysis. The powder is placed in a sample container and homogenized for field or fixed laboratory analysis. The procedure can be used to sample a single depth into the concrete, or may be modified to sample the concrete at distinctly different depth zones. The modified depth sampling procedure is designed to minimize any cross contamination between the sampling zones. If different

sampling depths are required, two different diameter drill bits and a vacuum sampling apparatus are employed.

3.0 Health and Safety

Eye and hearing protection are required at all times during sample drilling. A small amount of dust is generated during the drilling process. Proper respiratory protection and/or a dust control system must be in place at all times during sampling.

4.0 Interferences and Potential Problems

Since this sampling technique produces a finely ground uniform powder, physical matrix effects from variations in the sample consistency (i.e., particle size, uniformity, homogeneity, and surface condition) are minimized. Matrix spike analysis of a sample is highly recommended to monitor for any matrix related interferences.

As stated in Section 1.0 above, this sampling procedure is not recommended for volatile organic compound (VOC) analysis. The combination of heat generated during drilling and the exposure of a large amount of surface area will greatly reduce VOC recovery. If low boiling point semi-volatile compounds (i.e., naphthalene) are being analyzed, then the drill speed should be reduced to minimize heat build-up.

5.0 Equipment and Supplies

5.1 Single Depth Concrete Sampling

- 5.1.1 Rotary impact hammer drill
- 5.1.2 1-inch diameter carbide drill bits
- 5.1.3 Stainless steel scoopulas
- 5.1.4 Stainless steel spoonulas (for collecting sample in deeper holes, >2-inches)
- 5.1.5 Rectangular aluminum pans (to catch concrete during wall and ceiling sampling)
- 5.1.6 Gasoline powered generator (if alternative power source is required)

5.2 Multiple Depth Sampling (in addition to all the above)

- 5.2.1 ½ inch diameter carbide drill bits
- 5.2.2 Vacuum/sample trap assembly (see Section 7.2 and Figure 1)
 - 5.2.2.1 Vacuum pump
 - 5.2.2.2 2-hole rubber stopper
 - 5.2.2.3 Glass tubing (to fit stopper)
 - 5.2.2.4 Large glass test tubes, or Erlenmeyer flasks, for sample trap (several are suggested)
 - 5.2.2.5 Polyethylene tubing for trap inlet (Tygon tubing may be used for the trap outlet)
 - 5.2.2.6 Pasture pipets
 - 5.2.2.7 Pipe cleaners
 - 5.2.2.8 In-line dust filter (glass fiber filter, or equivalent)

6.0 Sample Containers, Preservation, and Storage

Concrete samples must be collected in glass containers for organic analyses, and may be collected in either glass or plastic containers for inorganic analyses. In general, a 2-ounce sample container with Teflon-lined cap (wide-mouth jars are preferred) will hold sufficient volume for most analyses. A 2-ounce jar can hold roughly 90 grams sample. Note, samples which require duplicate and/or matrix spike/matrix spike duplicate analyses may require a larger sample container, or additional 2-ounce sample containers.

Organic samples are to be shipped on ice and maintained at 4°C (\pm 2°C) until the time of extraction and analysis. Inorganic samples may be shipped and stored at room temperature. Refer to 40 CFR Part 136 for guidelines on analysis holding times.

To maintain sample integrity, chain-of-custody procedures must be implemented at the time of sampling to 1) document all sample locations and associated field sample identification numbers, 2) document all quality control samples taken, including field duplicates, split samples for confirmatory analyses, and PE samples, and 3) document the transfer of field samples from field sampler to field chemist or fixed laboratory.

7.0 Procedure

7.1 Single Depth Concrete Sampling

Lock a 1-inch diameter carbide drill bit into the impact hammer drill and plug the drill into an appropriate power source. (A gasoline generator will be needed if electricity is not available.) For easy identification, sample locations may be pre-marked using a crayon or a non-contaminating spray paint. (Note, the actual drilling point must not be marked.) Depending on the appearance of the sample location, or the objectives of the sampling project, it may be desired to wipe the concrete surface with a clean dry cloth prior to drilling. All sampling decisions of this nature should be noted in the sampling logbook. Begin drilling in the designated location. Apply steady even pressure and let the drill do the work. Applying too much pressure will generate excessive heat and dull the drill bit prematurely. The drill will provide a finely ground concrete powder that can be easily collected, homogenized and analyzed. Having several decontaminated impact drill bits on hand will help expedite sampling when numerous sample locations are to be drilled.

Sample Collection

A ½-inch deep hole (using a 1-inch diameter drill bit) generates about 10 grams of concrete powder. Based on this and the action levels for the project, determine the sampling depth, and/or the number of sample holes to be composited, to generate sufficient sample volume for all of the required analyses. (Note, with the absorbency of concrete, a ½-inch deep hole can be considered a surface sample.)

A decontaminated stainless steel scoopula can be used to collect the sample. The powder can either be collected directly from the surface of the concrete and/or the concrete powder can be scraped back into the hole and the less rounded back edge of the scoopula can be used to collect the sample. For holes greater than 2-inches in depth, a stainless steel spoonula will make it easier to collect the sample from the bottom of the hole.

To ensure collection of a representative sample when multiple analyses are required, a concrete sample should always be collected and homogenized in a single container and then divided up into the individual containers for the various analyses or split samples. This is particularly important when sample holes are deep, or when several holes are drilled adjacent to each other to form a sample composite.

Wall and Ceiling Sampling

A team of two samplers will be required for wall and ceiling sampling. The second person will be needed to hold a clean catch surface (i.e., an aluminum pan) below the drill to collect the falling powder. For wall samples, a scoopula, or spoonula, can be used to collect remaining concrete powder from within the hole. For ceiling holes, it may be necessary to drill the hole at an angle so the concrete powder can fall freely in the collection pan (and avoid falling on the drill). Another alternative might be to use the chuck-end of the drill bit and punch a hole through the center of the collection pan. The drill bit is then mounted through the pan and into the drill. Thus, the driller can be drilling straight up while the assistant steadies the pan to catch the falling dust. As a precaution, it may be advantageous to tape a piece of plastic around the drill, just below the chuck, to avoid dust contaminating the body of the drill and entering the mechanical vents. (Note, the plastic should deflect dust from the drill, but be loose enough underneath to allow for proper ventilation.)

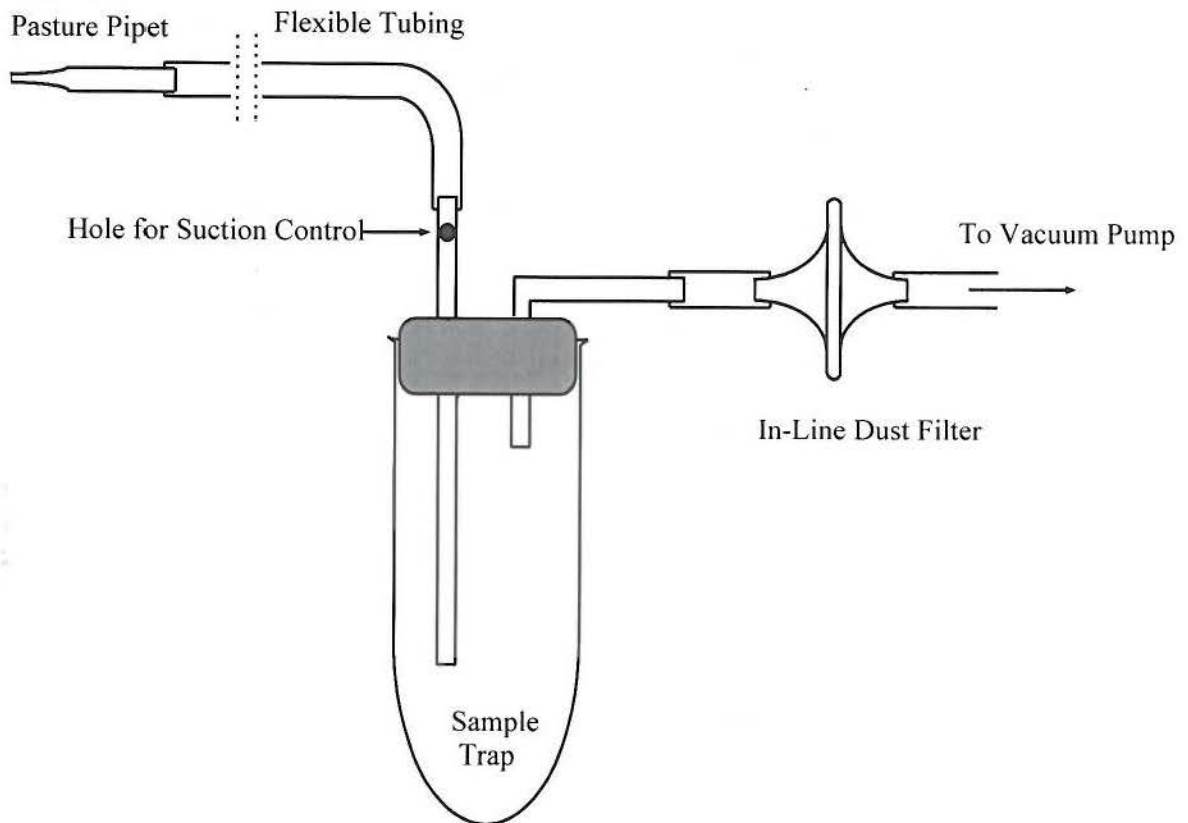
7.2 Multiple Depth Concrete Sampling

The above method for concrete sampling can also be used to collect samples from different depths within the concrete. To do this, two different sized drill bits (i.e., $\frac{1}{2}$ inch and 1 inch) and a simple vacuum pump with a vacuum trap assembly is required (see Figure 1). First, the 1 inch drill bit is used to drill to the first level and the concrete sample is collected as described in Section 7.1. The vacuum pump is then turned on and the hole is cleaned out using the vacuum trap assembly. The drill bit is then changed to the $\frac{1}{2}$ inch bit and the next depth is drilled out (the $\frac{1}{2}$ inch bit is used to avoid contact with the sides of the first hole). A clean tube or flask is placed on the vacuum trap, and the sample from the second drilling is collected. To go further, the 1 inch drill is used to open up the hole to the second level, the hole is cleared, and then the $\frac{1}{2}$ inch drill is used again to go to a third level, etc. Note, the holes and concrete surface should be vacuumed thoroughly to minimize any cross-contamination between sample depths.

Vacuum Trap Design and Clean-out

The trap presented in Figure 1 is a convenient and thorough way for collecting and removing concrete powder from drilled holes. The trap system is designed to allow for control of the suction from the vacuum pump and easy trap clean-out between samples. Note, by placing a hole in the inlet tube (see Figure 1), a finger on the hand holding the trap can be used to control the suction at the sampling tip. Thus, when this hole is left completely open, there will be no suction, and the sampler can have complete control over where and what to sample. To change-out between samples the following steps should be taken: 1) The pasture pipet and piece of polyethylene tubing at the sample inlet should be replaced with new materials, 2) the portion of the rubber stopper and glass tubing that was in the trap should be wiped down with a clean damp paper towel (wetted with deionized water) and then dried with a fresh paper towel, 3) a clean pipe cleaner should be drawn through the glass inlet tube to remove any concrete dust present, and 4) the glass tube or flask used to collect the sample should be swapped out with a clean decontaminated sample trap. Having several clean tubes or flasks on hand will facilitate change-out between samples.

Figure 1



7.3 Decontamination Procedure

Necessary supplies for decontamination include: two small buckets, a scrub brush, potable water, deionized water, a squirt bottle for the deionized water, and paper towels. The first bucket contains a soap and potable water solution, and the second bucket contains just potable water. Place all used drill bits and utensils in the soap and water bucket. Scrub each piece thoroughly using the scrub brush. Note, the concrete powder does cling to the metal surfaces, so care should be taken during this step, especially with the twists and curves of the drill bits. Next, rinse each piece in the potable water bucket, and follow with a deionized water rinse from the squirt bottle. Place the deionized water rinsed pieces on clean paper towels and individually dry and inspect each piece. Note, all pieces should be dry prior to reuse.

8.0 Field Documentation

All Site related documentation and reports generated from concrete sampling should be maintained in the central Site file. If personal logbooks are used, legible copies of all pertinent pages must be placed in the Site file.

8.1 Field Logbooks

All field documentation should be maintained in bound logbooks with numbered pages. If loose-leaf logsheets are used to document site activities, extra care should be taken in keep track of all logsheets.

The original copy of all logsheets should be maintained in the central Site file. Note, all sample locations must be documented by tying in their location to a detailed site map, or by using two or more permanent landmarks. The following information should be documented in the field logbooks:

- Site name and location,
- EPA Site Manager,
- Name and affiliation of field samplers (EPA, Contractor company name, etc.),
- Sampling date,
- Sample locations and IDs,
- Sampling times and depths, and
- Other pertinent information or comments

8.2 Sample Labeling and Chain-of-Custody

8.2.1 Sample Labels

Sample labels will be affixed to all sample containers. Labels must contain the following information:

- Project name,
- Sample number, and/or location
- Date and time of sampling,
- Analysis,
- Preservation, and
- Sampler's name.

8.2.2 Chain-of-Custody

All samples must be traced from collection, to shipment, to laboratory receipt and laboratory custody. The Chain-of-Custody (COC) Record is a multi-part form that is initiated as samples are acquired and accompanies a sample (or group of samples) as they are transferred from person to person. The COC form is signed by all individuals responsible for sampling, sample transport, and laboratory receipt. (Note, overnight deliver services, often used with sample transport, are exempt from having to sign the COC form. However, copies of all shipping invoices must be kept with the COC documentation.) One copy of the COC is retained by the field sampling crew, while the original (top, signed copy) and remaining carbonless copies are placed in a zip-lock bag and taped to the inside lid of the shipping cooler. If multiple coolers are required for a sample shipment to a single laboratory, the COC need only be sent with one of the coolers. The COC should state how many coolers are included with the shipment. All sample shipments to different laboratories require individual COC forms. The original COC form accompanies the samples until the project is complete, and is then kept in the permanent project file. A copy of the COC is also kept with the project manager, the laboratory manager, and attached to the data package.

8.2.3 Custody Seal

The Custody seal is an adhesive-backed label which is also part of the chain-of-custody process. The custody seal is used to prevent tampering with the samples after they have been collected in the field and sealed in coolers for transit to the laboratory. The Custody seals are signed and dated by a sampler and affixed across the opening edges of each cooler containing samples. Clear packing tape should be wrapped around the cooler, and over the Custody seal, to secure the cooler and avoid accidental tampering with the Custody seal.

9.0 **Quality Assurance and Quality Control (QA/QC)**

A solid QA/QC program is essential to establishing the quality of the data generated so that proper project decisions can be made. The following are key quality control elements which should be incorporated into a concrete sampling and analytical program.

9.1 **Equipment Blanks**

An equipment blank should be performed on decontaminated drill bits and collection utensils at a frequency of 1 per 20 samples or 1 per day, whichever is greater. To prepare the equipment blank, place the decontaminated drill bit and utensils in a large clean stainless steel bowl. Pour sufficient deionized water into the bowl to fill all of the required sample containers. Next, stir the drill bit and utensils in the bowl with a clean utensil to thoroughly mix the blank. Finally, decant off the equipment blank into the sample containers. Note, a clean funnel may help to pour off the equipment blank into the containers.

9.2 **Field Duplicates**

Field duplicates are samples collected adjacent to each other (collocated) at the same sample location (not two aliquots of the same sample). Field duplicates not only help provide an indicator of overall precision, but measure the cumulative effects of both the field and analytical precision, and also measure the representativeness of the sample. Field duplicates must be prepared and analyzed at a frequency of 1 per 20 samples or 1 per non-related concrete matrix, whichever is greater. An example of a non-related concrete matrix might be the investigation of two different types of chemical spills.

Calculate the Relative Percent Difference (RPD) between the sample and its duplicate using Equation 1.

$$RPD = \frac{|S - D|}{\frac{(S + D)}{2}} \times 100$$

Equation 1

Where:

S = Original sample result
 D = Duplicate sample result

The following general guidelines have been established for field duplicate criteria:

- If both the original and field duplicate values are \geq practical quantitation limit (PQL), then the control limit for RPD is $\leq 50\%$,
- If one or both values are $< \text{PQL}$, then do not assess the RPD.

If more rigorous field duplicate criteria are needed to achieve project DQOs, then that criteria should be documented in the project QAPP.

If the field duplicate criteria specified above are not met, then flag that target element with an “*” on the final report for both the original and field duplicate samples. Report both the original and field duplicate analyses; do not report the average. Field duplicate samples should be indicated on the sample ID. For example, the sample ID can contain the suffix “FD”.

9.3 Laboratory Duplicates

Laboratory duplicates are two aliquots of the same sample that are prepared, homogenized and analyzed in the same manner. (Note, proper sample homogenization is critical in producing meaningful results.) The precision of the sample preparation and analytical methods is determined by performing a laboratory duplicate analysis. Laboratory duplicates can be prepared in the field and submitted as blind samples, or the laboratory can be requested to perform the laboratory duplicate analysis. In the case of laboratory prepared duplicates, the field sampling team must be sure to provide sufficient sample volume. Laboratory duplicates must be prepared and analyzed at a frequency of 1 per 20 samples or 1 per non-related concrete matrix, whichever is greater.

Calculate the RPD between the sample and its duplicate using Equation 1. The following general guidelines have been established for laboratory duplicate criteria:

- If both the original and laboratory duplicate values are $\geq \text{PQL}$, then the control limit for RPD is $\leq 25\%$,
- If one or both values are $< \text{PQL}$, then do not assess the RPD.

If duplicate criteria are not met, then flag that target element with an “*” on the final report for both the original and duplicate samples. Report both the original and duplicate analyses; do not report the average.

9.4 Matrix Spike/Matrix Spike Duplicate Samples

Matrix spike/matrix spike duplicate samples (MS/MSDs) are two additional aliquots of a sample which are spiked with the appropriate compound(s) or analyte(s) of concern and then prepared and analyzed along with the original sample. (Note, proper sample homogenization, prior to spiking, is critical in producing meaningful results.) MS/MSDs help evaluate the effects of sample matrix on the analytical methods being used. The field sampling team must provide sufficient sample volume such that the field or fixed laboratory can prepare and analyze MS/MSDs at a frequency of 1 per 20 samples or 1 per non-related concrete matrix, whichever is greater.

Calculate the recovery of each matrix spike compound or analyte using Equation 2.

Equation 2

$$MSR = \frac{SSR - SR}{SA} \times 100$$

Where,

MSR = Matrix Spike Recovery, SA = Spike Added
 SSR = Spiked Sample Result, SR = Sample Result

Calculate the relative percent difference (RPD) between the recoveries of each compound or analyte in the matrix spike and matrix spike duplicate using Equation 3.

Equation 3

$$RPD = \frac{|MSR - MSR_D|}{\frac{MSR + MSR_D}{2}} \times 100$$

Where,

MSR = Matrix Spike Recovery
 MSR_D = Matrix Spike Duplicate Recovery

9.5 Performance Evaluation Samples

In accordance with the EPA Region I Performance Evaluation Program Guidance, performance evaluation (PE) samples should be submitted for each type of analysis to be performed in the field or by the fixed laboratory performing full protocol EPA methods. PE samples provide information on the quality of the individual data packages. PE samples are certified standard reference materials (SRMs) from a source other than that used to calibrate the instrument. If both field and fixed laboratories are being used to analyze samples, at least one solid PE sample should undergo both field analysis and confirmatory full protocol EPA method analysis to facilitate data comparability. A copy of the certified values for the SRM must be submitted with the final data packages to facilitate data evaluation.

9.6 Data Verification and Validation

All field data and supporting information (including chain-of-custody) that is collected during a concrete sampling episode should be verified daily, by a person other than that performing the work, to check for possible errors.

During the project planning process, a plan for data validation should be established for all data, both for field and fixed laboratories. All data must be validated to assure that it is of a quality suitable to make project decisions. For help in developing a data validation program refer to Region I, EPA New England, Data Validation Functional Guidelines for Evaluating Environmental Analyses.

9.7 Audits

9.7.1 Internal Audits

As part of the Quality Assurance/Quality Control Program for any sampling project, a series of internal audit checks should be instituted to monitor and maintain the integrity of the sample collection process. Timely internal reviews will insure that proper sampling, decontamination, chain-of-custody and quality control procedures are being followed. Also, the internal audit review is there to monitor any corrective actions taken, and/or institute corrective actions that should have been taken and were not. All corrective actions taken must be documented in an appropriate logbook, and if any corrective actions impact the final data reported, then they must also be documented in the final report narrative. The results of all internal audits must be documented in a report, and copies of the report issued to the Project Manager and the Quality Assurance Manager. The original copy of any audit report must remain with the main project file and be available for review.

9.7.2 External Audits

The Agency reserves the right to perform periodic field audits to ensure compliance with this SOP.

10.0 References

- 1) Guidance for the Data Quality Objective Process, QA/G-4, EPA/600/R-96/055, September 1994.
- 2) EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations, QA/R-5, Interim Final, October 1997.
- 3) Guidance for the Preparation of Standard Operating Procedures for Quality-related Operations, QA/G-6, EPA/600/R-96/027, November 1995.
- 4) Region I, EPA-New England Data Validation Functional Guidelines for Evaluating Environmental Analyses, July 1996.
- 5) EPA Region I Performance Evaluation Program Guidance, July 1996.
- 6) U.S. EPA Code of Federal Regulations, 40 CFR, Part 136, Appendix B, Revised as of July 1995.